Laboratory Detection of *Chlamydia trachomatis*

Chlamydia trachomatis infection is the leading cause of sexually transmitted diseases in the Western world. Lower genital tract infections in females are frequently asymptomatic and therefore undetected. Infections by *C trachomatis* can involve the upper genital tract as well, leading to tubal scarring and infertility. Neonatal infections due to exposure at birth are also well-established complications. For these reasons, routine screening is recommended for those most at risk of developing a *C trachomatis* infection—sexually active adolescents and women in their early twenties and those with new sexual partners.

Tests for the laboratory detection of *C trachomatis* are based on detecting antigen, nucleic acid, or viable organisms. Since there are major differences in the performance, sensitivity, and specificity of these tests, it is important to understand these distinctions.

The first laboratory test available, the culture, was until recently the gold standard of *Chlamydia* testing. Its specificity of 100% makes it the only recommended test for children or victims of sexual abuse. Culture should detect even a single viable *Chlamydia* organism, but its sensitivity can be compromised by variables such as loss of viability upon transport or storage, differences in susceptibilities of cell lines, and stains used in the culture technique. Furthermore, there is no standard culture method, so results vary widely between laboratories.

The first commercially available assays were based on the detection of chlamydial antigens using polyclonal and/or monoclonal antibodies that recognize either the major outer membrane protein or lipopolysaccharide of the organism. Today, antigen detection tests range from a 20-minute paper- or wafer-based assay to a 3- to 4-hour enzyme immunoassay (EIA). The specificity of the assays is, with few exceptions, acceptable (>98%). Reported sensitivities of these tests vary tremendously, neutralizing any comparison based on literature review. Most evaluations of the antigen-based assays have used culture as a gold standard but, since the sensitivity of the culture method can vary, the apparent sensitivity of the antigen detection method fluctuates. When DNA amplification methods are run in parallel with culture, the sensitivity of the antigen-based assays ranges between 50 and 70%. Therefore, while these assays may be convenient in terms of time, simplicity, and cost, many are too insensitive for routine screening. DNA hybridization methods, which are labor-intensive, have proven to yield sensitivities and specificities similar to the antigen-based methods.

The most sensitive means of *Chlamydia* detection so far are the commercially available nucleic acid amplification–based assays, such as polymerase and ligase chain reactions. They are estimated to be 10 to 20% more sensitive than culture. A great advantage is that urine has been shown to be an acceptable specimen for detecting *C trachomatis*. This is a significant advance, especially for testing males, since it makes a urethral swab unnecessary. These assays are more expensive than the antigen detection assays, however. They are also more technically demanding—they require sophisticated equipment and an average of 4–5 hours. Inhibition of the assay has been reported, but future generations of the tests promise to improve on these problems.

In summary, antigen detection methods, while easy to perform and readily available, have low sensitivity. Due to the technical requirements of DNA amplification, the most sensitive method for *Chlamydia* detection, the test is generally not found in small laboratories but in more centralized testing facilities. Culture, due to its variability and tight restrictions of specimen collection and transportation, is impractical for most small laboratories but can be found in large teaching hospitals and reference laboratories.

ELLENA M. PETERSON, PHD
Irvine, California

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Diseases Associated With the Major Histocompatibility Complex

THE MAJOR HISTOCOMPATIBILITY COMPLEX (MHC) is a genetic region that encodes for class I and class II molecules and a variety of other proteins. The class I and class II molecules are human leukocyte antigen (HLA) proteins and are essential for the immune system to recognize and respond to foreign antigens. This region of the genome is diverse, with hundreds of alleles of the different HLA genes. Because of its importance in organ transplantation, the MHC locus has been the focus of many studies; many of the alleles are known. Other than HLA antigens, the MHC encodes for a variety of other proteins including proteins from the complement system and tumor necrosis factor (TNF).

Some HLA alleles have been found to be correlated with specific diseases, so determining a patient's HLA type is useful in diagnosing a disease, diagnosing a variant of a disease, predicting a person's susceptibility to a disease, or predicting the course of a disease. There are several explanations for the predictive value of HLA types. Many infectious and autoimmune diseases are influenced by the immune response. Different HLA types may be associated with differences in immune responses